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# Dispersal movements of green turtle (*Chelonia mydas*) reared for one month after emergence

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***ABSTRACT***
The objective of this study was to determine whether turtles reared for a period after hatching have the willingness to migrate offshore. In order to do this, the swimming behavior of green turtles (*Chelonia mydas*) reared for 28 to 56 days was monitored after their release from the beach. Eggs of green turtles laid on the beaches were collected and buried into an artificial beach. After their emergence, the turtles were reared for 28 to 56 days in containers. Six active and healthy looking turtles were selected and we tracked them after release from the beach. After release, the experimental turtles moved to the north, but their movements were meandering. Moreover, one turtle temporarily drifted onto the beach due to ocean current. The mean speed of movement was 0.75 ± 0.11 km/h. The distance from the beach during the experiment period was 1467 ± 460 m. Their movement speeds were significantly slower than those of frenzy turtle reported in previous studies. In conclusion, the results of the study indicated that the turtles reared for longer periods may not be able to migrate offshore as effectively as if they were released naturally from the beach.

**KEYWORDS: *Chelonia mydas*, headstarting, radio telemetry, orientation**

## INTRODUCTION

Sea turtle hatchlings emerge from underground nests, crawl down to the ocean, and swim rapidly away from the shore (Lohmann et al. 1997). After entering the water, hatchlings undergo a period of hyperactive swimming (termed the "frenzy", Carr 1962) (Wyneken & Salmon 1992). This frenzy is characterized by nearly continuous swimming for the first 24 hours (Salmon & Wyneken 1987). After the frenzy (the "post frenzy period"), the activity of hatchlings gradually decreases, and they swim only during the day and are inactive at night (Wyneken & Salmon 1992). Also, Wyneken (2000) described that hatchlings released hours or days after emergence may change their swimming rates before they have distanced themselves far enough from coastal waters, or have reached their nursery areas. Therefore, it has been a concern whether headstarted turtles disperse to the open sea after their release like wild turtles, in other words, that they are able to reach the open sea. To date, however, no field survey has yet been made to investigate the difference in the dispersal process or swimming behavior of hatchlings as time goes by or they grow up.

The objective of this study was to determine whether the turtles reared for a period after their hatching have the willingness to migrate offshore. In order to study this, the swimming behavior of the green turtles (*Chelonia mydas*) reared for 28 to 56 days was monitored after their release from the beach.

## MATERIALS AND METHODS

Eggs of green turtles (*Chelonia mydas*) laid on the beaches at Ibaruma beach which is located in the northeastern part of Ishigaki Island, Japan were collected. These eggs were carried to Yaeyama Station, Seikai National Fisheries Research Institute,Fisheries Agency, and then buried into an artificial beach at this station. About 90 % of them hatched in the expected period. After their emergence, the turtles were reared for 28 to 56 days in containers.

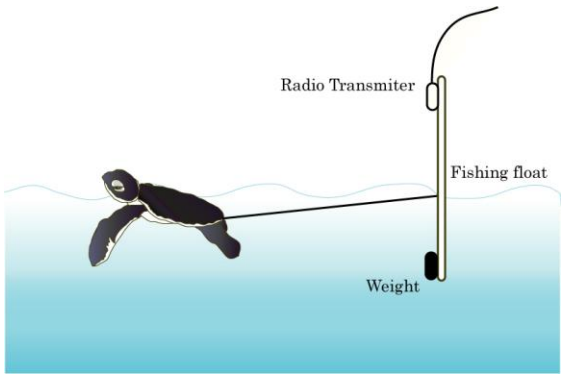


Fig.1. Schematic diagram of the tracking of the experimental turtles. The turtles pulled the fishing float (*in total:* Length x Diameter = 120 x 12 mm, 7.56 g in air, -1.86 g in water) with radio transmitter (8.2 mm in diameter, 19 mm in length and 1.0 g in water; MBFT-7M Lotek Co. Ltd) and balance weight. The fishing float was tethered with 80 cm of nylon line and attached to ventral surface of the pygal scute with a fishing hook.

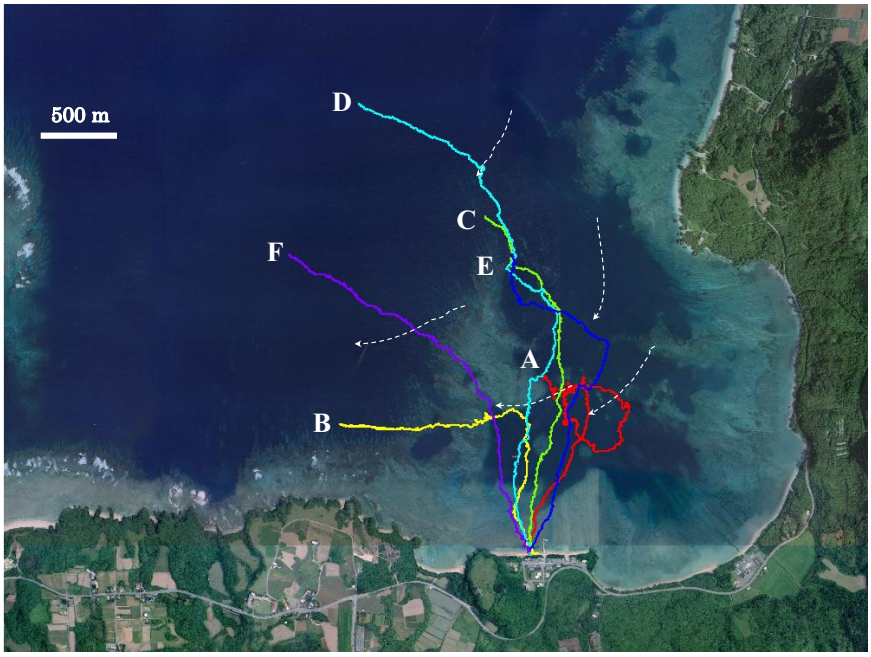


Fig.2 Dispersal patterns of 28 to 56 day old turtles. Colored continuous lines represent each turtle's movement. Dashed arrows indicate the typical flows of surface ocean current in the experimental area.

Table 1. Summary of physical data of the experimental turtles.

| ID | Rearing period (d) | SCL (cm) | BW (g) |
|---|---|---|---|
| A | 28 | 5.57 | 34 |
| B | 29 | 5.1 | 33 |
| C | 57 | 6.66 | 47 |
| D | 30 | 5.54 | 30 |
| E | 57 | 6.18 | 43 |
| F | 58 | 5.8 | 38 |

From the third day, they were fed once a day on a diet which was a mixture of anchovies (*Engraulis japonica*), mysids (*Neomysis intermedia*), and clams (*Paphia* (*Neotapes*) *undulata*) and was supplemented with vitamins and calcium. The containers and turtles were washed and cleaned almost every night. Six active and healthy looking turtles were selected from the reared ones and were used as experimental turtles. The straight carapace lengths (SCL) and body weights of the turtles are summarized in Table 1. After the experiment, all turtles were collected and then re-released at the Ibaruma beach.

The experimental turtles towing a fishing float with a tiny radio transmitter (Fig.1) were released from the beach in front of the Yaeyama Station, and then were tracked by a small boat for 3 hours. The tracking was based on visual observation and radio telemetry using a radio receiver and four-element Yagi antenna (FT-290mk-Ⅱ/AR, Yaesu Musen Co. Ltd.).

During the experiment, we obtained the positional data of the small boat every 1 to 5 minute(s) by using GPS (GARMIN Co. Ltd.) which was assumed to be the position of the turtles. Based on this data, we calculated the moving trajectory, speed of movement and direction of movement of the turtles in order to determine if the turtles were able to disperse effectively to the open ocean. The location information from GPS included the longitude, latitude, and time at the measured points. From this data we calculated the speed, distance and direction of movement of each tracking. GIS software, KASHMIR 3D ver. 8.1.7 (© Sugimoto Tomohiko) was used to analyze the location information.

## RESULTS

After the release, the experimental turtles moved to the north, but their movements were meandering. Moreover, one turtle temporarily drifted to the beach due to ocean current (Fig.2. red line). The mean speed of movement was 0.75 ± 0.11 km/h. The distance of movement from the beach during the experiment period was 1467 ± 460 m.

## DISCUSSION

Green turtle hatchlings during the frenzy period were reported to move at speeds of 1.57 km/h (Wyneken 1996), 1.56 km/h (Frick 1976), and 1.62 km/h (Abe et al. 2000). The speed of movement of the turtles reared for over 28 days was significantly slower than that of frenzy turtle, although the effect of towing the fishing float has to be considered. The activity of green turtle hatchlings is known to reduce as time goes by (Wyneken & Salmon 1992). Therefore, the speed and distance of movement would decrease as turtles grow. This implies that the turtles reared for over 28 days take a much longer time to reach the

open sea than frenzy turtles.

The heading of frenzy turtles was maintained in a constant direction towards the open sea (Frick 1976, Salmon & Wyneken 1987). However, the directions of movement of the turtles reared for over 28 days were meandering and were not directly oriented to the open sea (Fig.2). In addition, one turtle temporarily drifted to the beach due to ocean current (Fig.2 red line). This suggests that turtles over 28 days old possibility might not reach the open sea.

In conclusion, the results of the study indicate that the turtles reared for a longer period may not be able to migrate offshore as effectively as if they were released naturally from the beach. In this study, each experiment was conducted for only three hours. Thus, as the next step, we need to further monitor the dispersal and swimming abilities of turtles for a longer period until they reach the open sea.

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**REFERENCES**

Abe O., Takada Y., Shibuno T., Hashimoto K., Ishii H. and Funakura Y. (2000). Swimming behavior of green turtle hatchlings in a lagoon of Ishigaki Island, southwestern Japan. *In: Sea Turtles of the Indo-Pacific.* N. Pilcher and G. Ismail (Eds). ASEAN Academic press. 167-175.

Carr A.F. (1962). Orientation problems in the high seas travel and terrestrial movements of marine turtles. *Am. Sci.* **50**:359-374.

Frick J. (1976). Orientation and behavior of hatchling green turtles in the sea. *Anim. Behav.* **24**: 849-857.

Lohmann K.J., Witheringthon B.E., Lohmann C.M.F. and Salmon M. (1997). Orientation, navigation, and natal beach homing in sea turtles. *In: The Biology of Sea Turtles.* (Eds) Lutz P. L. & Musick J. A. CRC Press, Boca Raton. 107-135.

Salmon M. and Wyneken J. (1987). Orientation and swimming behavior of hatchling loggerhead turtles Caretta caretta L. during their offshore migration. *J. Exp. Mar. Biol. Ecol.* **109**: 137-153.

Wyneken J. and Salmon M. (1992). Frenzy and Postfrenzy swimming activity in loggerhead, green, and leatherback hatchling sea turtles. *Copeia* **1992** (2): 478-484.

Wyneken J. (1997). Sea turtle locomotion: mechanisms, behavior, and energetics. *In: The Biology of Sea Turtles. (Eds.) Lutz P.L. & Musick J.A., CRC Press, Boca Raton*. 165-198.

Wyneken, J. (2000). The Migratory Behavior of Hatchling Sea Turtles Beyond the Beach. *In: Sea Turtles of the Indo-Pacific.* (Eds) Pilcher N. and Ismail G., ASEAN Academic press. 121-129.